

Research Application Summary

**Constraints affecting production and post-harvest handling of sweetpotato
(*Ipomoea batatas*) in Ethiopia**

Gurmu, F.,^{1,2} * Hussein, S.¹ & Laing, M.¹

¹University of KwaZulu-Natal, African Center for Crop Improvement, Private Bag X01, Scottsville
3209, Pietermaritzburg, South Africa

²Southern Agricultural Research Institute, Hawassa Research Centre, P.O. Box 6, Hawassa,
Ethiopia.

*Corresponding author: fekadugurmu@yahoo.com

Abstract

Sweetpotato is an important food security crop for millions of households in sub-Saharan Africa. However, its production is constrained by a number of biotic, abiotic and socioeconomic factors. The objective of this study was to assess and document the major constraints to sweetpotato production in Ethiopia. The study also reviewed pre and post harvest handling practices in Ethiopia. The study was conducted in three major sweetpotato growing zones in southern Ethiopia using a participatory rural appraisal (PRA) methodology involving 183 households. Heat and drought (21.6%), shortage of planting materials (20.1%), shortage of land (15.7%), diseases (10.0%), insect pests (9.4%), a lack of draft power (8.1%), shortage of money to cover input costs (7.9%), a lack of labour (5.1%) and weeds (2.0%) were identified by the study as the major sweetpotato production constraints. Poor access to markets (22.6%), poor market prices (19.1%), low yield (14.2%), low dry matter content of storage roots of existing varieties (13.6%), a lack of knowledge about sweetpotato processing and preservation (11.7%), access to processing equipment (11.1%) and the logistics of transporting a heavy, bulky crop (7.7%) to market were identified as the major post-harvest constraints. Most farmers stored sweetpotato root *insitu* but reported challenges of heat (31.6%), insect pests (mainly weevils) (25.6%), diseases (21.8%) and rodents (20.9%). The problem of low yield and low dry matter content can be solved through breeding and agronomic interventions. Experience from other sweetpotato growing regions demonstrate that socio-economic challenges can be overcome.

Key words: Drought, Ethiopia, *Ipomoea batatas*, *insitu* storage, participatory rural appraisal, pre- and post-harvest constraints, sweetpotato

Résumé

La patate douce est une culture importante de sécurité alimentaire pour de millions de ménage en Afrique Sub-Saharienne. Toutefois, la production de la patate douce présente un bon nombre de contraintes liées aux facteurs biotiques, abiotiques et socio-économiques. L'objectif de cette étude est d'évaluer et de documenter les majeures contraintes de la

production de la patate douce en Éthiopie. L'étude a réexaminé les pratiques de gestion avant and après récolte. Elle a été conduite dans trois zones de production majeure de la patate en utilisant une méthode d'évaluation rurale participative impliquant 183 ménages. La température et la sécheresse (21,6%), le manque de matériel végétal (20,1%), le manque de terre (15,7%), les maladies (10,0%), les pestes (9,4%), le manque de pouvoir de traction (8,1%), le manque de financement pour les couts d'intrants (7,9%), le manque de main-d'œuvre (5,1%) et les mauvaises herbes (2%), ont été identifiées comme contraintes majeures de production de la patate. L'accès limité au marché (22,6%), les faibles prix des marches (19,1%), le faible rendement (14,2%), le faible taux en matière sèche des racines de stockage des variétés existantes (13,6%), un manque d'information sur la transformation et la préservation (11,7%), l'accès aux équipements de transformation (11,1%) et les logistiques de transport des récoltes aux marché (7,7%), ont été identifiées comme contraintes majeures de post-récolte. La plupart des agriculteurs pratiquent le stockage in-situ, mais ont reporté des contraintes liées à la chaleur (31,6%), les pestes (surtout les charançons) (25,6%), les maladies (21,8%) et les rongeurs (20,9%). Les contraintes de faible rendement et de faible taux en matière sèche, peuvent être résolues à travers les interventions agronomiques de production. Les expériences des autres zones de production montrent que les contraintes socio-économiques peuvent être résolues.

Mots-clés : Sécheresse, Éthiopie, *Ipomoea batatas*, stockage in situ, évaluation rurale participative, contraintes pré et post-récolte, patate douce

Introduction

Sweetpotato (*Ipomoea batatas* (L.) Lam.] is an important food security crop for millions of households in sub-Saharan Africa (SSA) and Asia. Both white and orange fleshed sweetpotatoes are commonly grown, providing carbohydrate and vitamins. The orange fleshed sweetpotatoes (OFSP) are especially rich in β -carotene, a vitamin A precursor and plays a crucial role in preventing vitamin A deficiency (VAD) that leads to blindness and maternal and pre-school children mortality in many developing countries (Wang *et al.*, 2011). Compared to other root crops, sweetpotato has the advantages of a high yield potential and adaptability to a wide range of agro-ecologies including drought affected environments (Lebot, 2010; Wang *et al.*, 2011). In Ethiopia, it is the second most important root and tuber crop after enset [*Ensete ventricosum* (Welw.) Cheesman] (CSA, 2010, 2011).

However, sweetpotato production is curtailed by a number of biotic, abiotic and socioeconomic constraints, both pre- and post-harvest. The biotic stresses include diseases, insect pests and weeds, whereas the abiotic factors are drought, heat and low soil fertility (Kapinga and Carey, 2003; Ndunguru *et al.*, 2009). Constraints related to socioeconomic and quality attributes include a lack of access to improved varieties, and to planting material, the low β -carotene content in the white fleshed sweetpotatoes and a low dry matter content (DMC) in the OFSP varieties that are currently available (Belehu, 2003; Kapinga and Carey, 2003; Tadesse, 2006; Tofu *et al.*, 2007). Poor post-harvest handling techniques are among the key factors that reduce the quality and value of the crop. In Ethiopia, there is little information on the constraints affecting sweetpotato production and its post-harvest

handling. This study was designed to assess and document the major constraints affecting production, and pre- and post-harvest handling of sweetpotato.

Methodology and approaches

The study was conducted in three major sweetpotato growing administrative zones (Sidama, Wolayta and Gamo Gofa) in the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia. Two districts were purposely selected from each zone and two villages were identified from each district. Fifteen farmers were selected from each village except in three villages in Gamo Gofa zone where 16 farmers each were selected. This provided a total of 183 participants for the study. In each village, farmers growing sweetpotato were selected at random for semi-structured interviews and for focus group discussions, regardless of their socio-economic status and gender.

Semi-structured interviews were administered, and focus group discussions were conducted with the selected farmers in order to identify the major constraints affecting sweetpotato production and post-harvest handling. The study was conducted using participatory rural appraisal (PRA) methodologies (Chambers, 1994). Data were collected employing semi-structured interviews, discussion with key informants, focus group discussions, ranking and scoring (preference ranking, pair-wise ranking and matrix scoring), proportional piling, transect walks, and triangulation (Chambers, 1994; Bhandari, 2003). Secondary data were also included from the Central Statistical Agency of Ethiopia and SNNPR Office of Agriculture.

The data were coded, entered and analyzed using Statistical Package for Social Scientists (SPSS) Windows Version 19.0 (SPSS Inc, 2009). Data were analyzed using cross tabulations and means. Frequencies, percentages and graphical representations were used to present the results.

Results and discussion

Major pre-harvest constraints affecting sweetpotato production. Different sweetpotato production constraints were identified. The major sweetpotato production constraints in Ethiopia as identified by respondent farmers included heat and drought (21.6%), shortage of planting materials (20.1%), shortage of land (15.7%), diseases (10.0%), insect pests (9.4%), a lack of draft power (oxen, donkeys etc.) (8.1%), shortage of money to cover input costs (7.9%), a lack of labour (5.1%) and weeds (2.0%). Pair-wise ranking of major production constraints in the three zones is summarized in Table 1. Heat and drought are the foremost important sweetpotato production constraints followed by shortage of planting materials, shortage of land, diseases and insect pests.

Sweetpotato is known as a relatively drought tolerant crop. Of the respondent interviewed, 86.3% grew sweetpotato when there was a drought or when their major cereal crops such as maize, sorghum and wheat failed. However, due to the global climate change, even this crop is now affected by heat and drought, and its yield potential is being diminished. This also holds true for other crops that have been considered to be highly drought tolerant, such as cassava and enset. Farmers (87.6%) also indicated that a shortage of planting material was

a serious problem affecting sweetpotato production. This problem is also linked to severe heat and drought that was described by many of the respondents. Severe drought limits vegetative production and reduces planting material availability. A shortage of suitable land was considered to be another challenge. This is because the land holdings of most of the households are small, usually less than one hectare (CSA, 2001). Although disease and pests are among major constraints of sweetpotato, the farmers in the study area were less concerned about these constraints as shown by their rankings.

Post-harvest constraints. The major post-harvest constraints of sweetpotato were identified by the farmers (Figure 1) as: poor access to markets (22.6%), poor market prices (19.1%), low yield (14.2%), low dry matter content of storage roots of existing varieties (13.6%), a lack of knowledge about sweetpotato processing and preservation (11.7%), limited access to processing equipment (11.1%) and the logistics of transporting a heavy, bulky crop (7.7%) to market. On-station performance of sweetpotato in Ethiopia and other countries indicate that the problem of low yield and dry matter content can be solved through breeding and agronomic interventions. The problems related to the marketing and processing of the products are more complex socio-economic issues.

In Ethiopia sweetpotato are traditionally processed into numerous products, including bread, enjera, flour, cakes, wot (stew), beer and juice (unpublished data). Given proper training, and access to appropriate equipment, farmers could make a range of food items from sweetpotato. This would reduce the post-harvest losses of the crop and helps to maximize its utilization.

Table 1. Pair-wise ranking of sweetpotato production constraints in the Sidama, Wolayta and Gamo Gofa zones of the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia

Constraints	A	B	C	D	E	F	G	H	I	Score	Rank
A	A	A	A	A	A	A	A	A	A	8	1
B		B	B	E	F	G	H	B		3	6
C			C	E	F	G	H	C		2	7
D				E	F	G	H	D		1	8
E					E	E	E	E		7	2
F						F	F	F		6	3
G							G	G		5	4
H								H		4	5
I									I	0	9

A = heat and drought, B = a lack of draft power, C = shortage of money, D = labour shortage, E = shortage of planting materials, F = shortage of land, G = diseases, H = insects, I = weeds

Post-harvest problems affecting sweetpotato are mostly related to its short shelf-life, which is influenced by the quality of the storage roots. Most respondents (98.4%) indicated storing the storage roots *in-situ* in the soil and harvesting them as and when they were needed for food. However, the major constraints that affect sweetpotato storage roots while leaving them in the soil were described by the respondents as heat (31.6%), insect pests (mainly weevil) (25.6%), diseases (21.8%) and rodents (20.9%) (Figure 2). The farmers believed that some rain is favorable for prolonging storage of roots in the soil, which was an unexpected observation. A few farmers (1.6%) in Gamo Gofa were using solar energy to dry sweetpotato root slices after harvest.

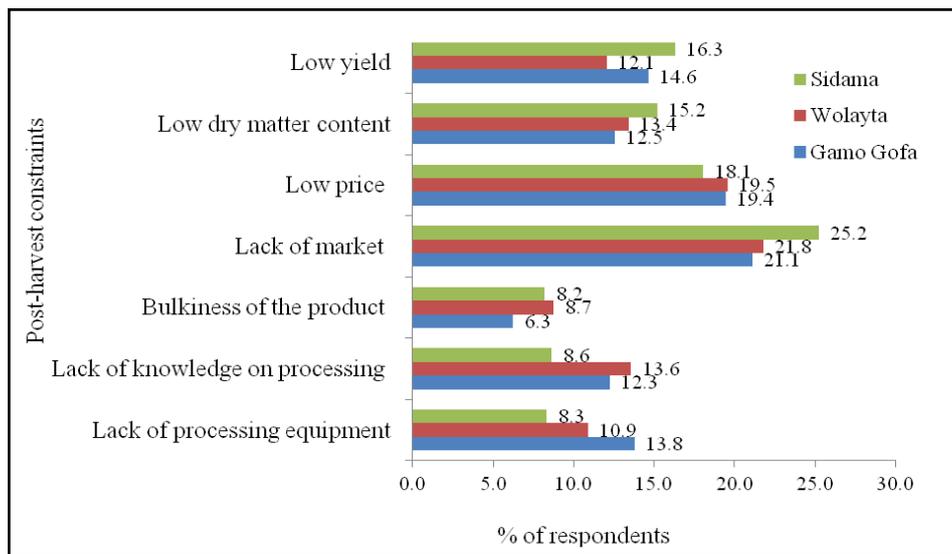


Figure 1. Farmer’s perceptions of the post-harvest constraints affecting sweetpotato in the Sidama, Wolayta and Gamo Gofa zones of the Southern Nations, Nationalities, and Peoples’ Region of Ethiopia

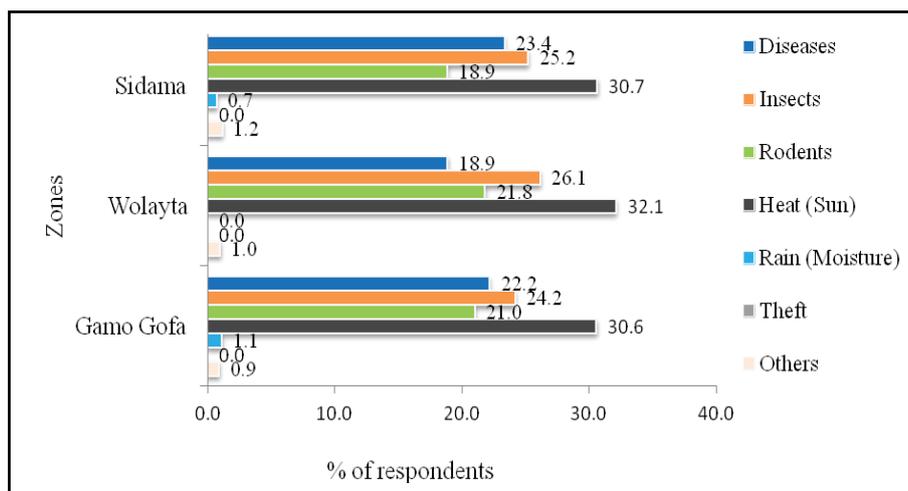


Figure 2. Post-harvest root storage problems in Sidama, Wolayta and Gamo Gofa zones of the Southern Nations, Nationalities, and Peoples’ Region of Ethiopia

Conclusion and recommendations

Sweetpotato is an important food security crop in Ethiopia. In the SNNPR of Ethiopia the major production constraints are considered to be heat and drought (21.6%), shortage of planting materials (20.1%), shortage of land (15.7%), diseases (10.0%) and insect pests (9.4%). Further, the major post-harvest constraints included poor access to markets (22.6%), poor market prices (19.1%), low yield (14.2%), low dry matter content of storage roots of existing varieties (13.6%), a lack of knowledge about sweetpotato processing and preservation (11.7%), limited access to processing equipment (11.1%) and the logistics of transporting a heavy, bulky crop (7.7%) to market. Since most farmers store their sweetpotato crops in the soil, heat (31.6%), insect pests (25.6%), diseases (21.8%) and rodents (20.9%) were identified as key factors affecting the storage of sweetpotato storage roots. Strategic breeding, agronomic and socio-economic interventions are required to improve sweetpotato productivity, marketing and processing.

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